

What is claimed is:

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1. A rotary machine comprising:  
a case having an exterior surface, a drive end, an opposite end, and an  
interior working chamber;  
a rotary shaft supported for rotation within the working chamber between the  
drive end and the opposite end;  
at least one machine component supported on the rotary shaft for rotation in  
the working chamber;  
10 at least one air inlet and at least one air outlet formed in the case;  
a first fan supported for rotation on the rotary shaft within the working  
chamber and arranged for moving air through the working chamber from the at least  
one air inlet over the at least one machine component to the at least one air outlet;  
15 a cowl received over the case opposite end and defining a plenum between an  
interior surface of the cowl and the case opposite end, the cowl defining an annular  
exhaust opening around a perimeter of the cowl and facing the case exterior surface;  
and  
a second fan positioned within the plenum and mounted for rotation on a  
20 portion of the rotary shaft, the second fan being arranged for assisting the first fan  
in moving air through the working chamber and for moving at least a portion of air  
within the plenum through the exhaust opening and over the case exterior surface.

25 2. A rotary machine according to claim 1, wherein the second fan is  
supported for rotation on a portion of the rotary shaft extending from the case.

30 3. A rotary machine according to claim 1, further comprising:  
a gap between an inner surface of the case and the at least one machine  
component permitting air to flow through the working chamber between the case  
and the machine component.

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4. A rotary machine according to claim 1, further comprising:  
a plurality of longitudinal openings provided in portions of the at least one machine component permitting air to flow through the at least one machine component during operation.

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5. A rotary machine according to claim 1, wherein the at least one machine component includes a rotor section and a stator section of an electric motor concentrically carried on the rotary shaft.

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6. A rotary machine according to claim 1, wherein the cowl further includes at least one air inlet port formed concentric with the rotary shaft for admitting additional air into the plenum, a portion of which is directed over the exterior surface of the case.

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7. A rotary machine according to claim 1, wherein the at least one air inlet is provided through the drive end of the case.

8. A rotary machine according to claim 1, wherein the at least one air inlet is provided through the case near the drive end.

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9. A rotary machine according to claim 1, wherein the at least one air outlet is provided through the opposite end of the case.

10. A rotary machine according to claim 1, wherein the at least one air outlet is provided through the case near the opposite end.

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11. A rotary machine according to claim 1, further comprising at least one housing extension defining a cavity in communication with the interior working chamber of the case, the cavity having at least one air inlet port and at least one air outlet port defining a longitudinal air flow path through the cavity.

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12. A rotary machine according to claim 1, wherein the first fan is arranged for moving air from the drive end toward the opposite end of the case and wherein the second fan moves air exiting the at least one air outlet toward the exhaust opening of the plenum.

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13. A rotary machine according to claim 1, wherein the first fan is arranged for moving air from the opposite end toward the drive end of the case.

14. A rotary machine according to claim 1, further comprising:  
a baffle plate positioned between the at least one air inlet and the first fan, the baffle plate having <sup>one or more</sup> ~~a plurality of~~ air openings formed therethrough and being arranged to assist in distributing air over the interior working chamber near the at least one air inlet.

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15. A rotary machine according to claim 1, further comprising:  
an inlet chamber in communication with the at least one air inlet, the inlet chamber positioned near the first fan, and  
a plurality of air passages provided in a wall of the inlet chamber facing the first fan arranged to assist in distributing air over the interior working chamber near the first fan.

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16. A rotary machine according to claim 1, further comprising:  
at least one supplemental air outlet positioned upstream of the at least one air outlet for permitting a portion of the air moving through the interior working chamber to exit the case prior to reaching the at least one air outlet.

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17. A rotary machine according to claim 1, further comprising a plurality of air inlets.

18. A rotary machine according to claim 1, further comprising a plurality of air outlets.

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19. A rotary machine according to claim 1, further comprising:  
a baffle flange disposed around a circumference of an interior surface of the working chamber near the first fan.

5 20. A method of cooling a rotary machine having a case, a rotary shaft supported within an interior working chamber of the case, and at least one machine component supported for rotation on the rotary shaft within the working chamber, the method comprising the steps of:

10 providing at least one air inlet and at least one air outlet in fluid communication with the working chamber;

mounting a first fan for rotation on the rotary shaft within the working chamber;

mounting a second fan for rotation on the rotary shaft within a plenum on one end of the machine and exterior to the case;

15 arranging the first fan for moving air through the working chamber of the case from the at least one air inlet and over the at least one machine component to the at least one air outlet; and

20 arranging the second fan for moving at least a portion of air within the plenum back over an exterior surface of the case and for assisting the first fan in moving air through the working chamber.

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